Innovative BMPs for Stormwater Dissolved Metals Removal

Scott Tobiason – ***Port of Seattle, Sea-Tac Airport***

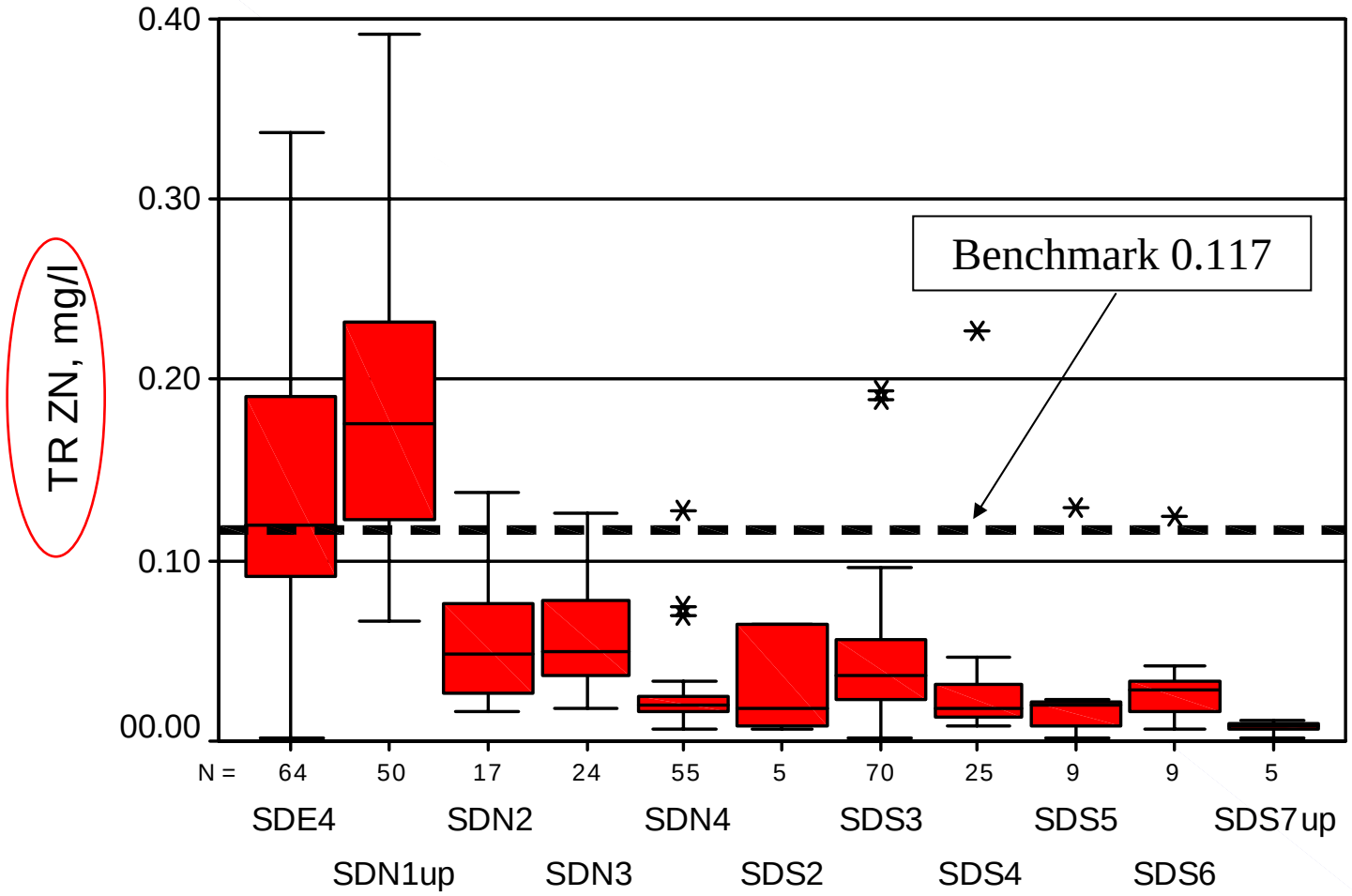
Presentation for Boeing/Ecology Industrial Stormwater Conf
Oct 7, 2003 Seattle, WA

Metals in stormwater

1. Sources
2. Impacts and Issues
3. BMP Solutions?
4. Testing Programs

Zinc at Sea-Tac Airport Outfalls

(composite samples July 1994-May 2003)



Zinc Sources

- Uncoated Galvalume® roofing
- Guardrails
- Fencing, posts
- Vehicles (tires)

Source Significance

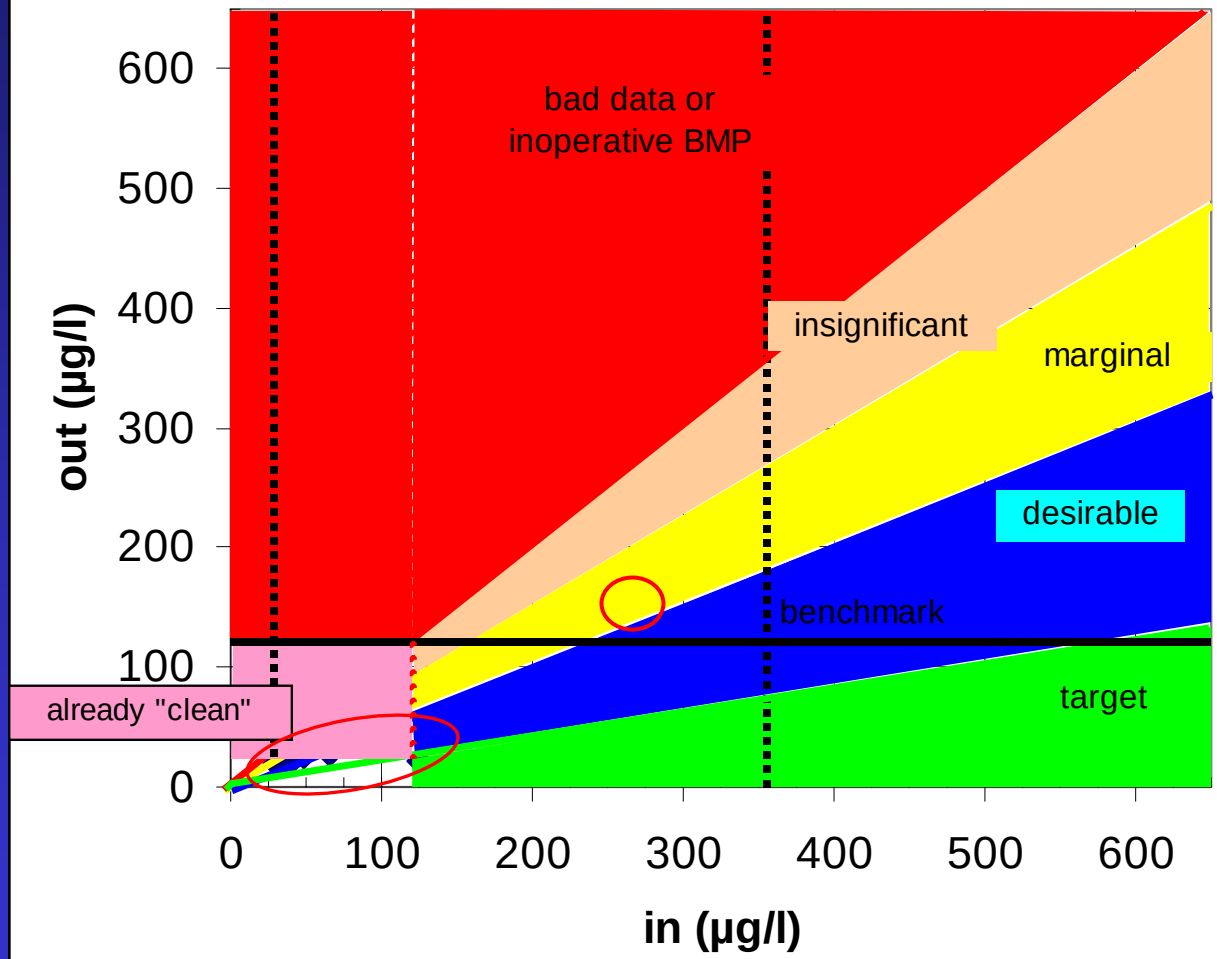
- Connectivity to drainage system
- Proximity to receiving water
- Bioavailability of dissolved fraction
  - rarely 100% bioavailable
  - dissipates rapidly w/solids, organic matter contact

BMP Solutions?

- **Source control**
  - Retrofit (painting, re-roofing)
  - Eliminate by specification (e.g. vinyl fence)
- **Treatment**
  - "conventional BMPs"
    - limited, mediocre data for dissolved metals
  - "emerging technologies"
    - "black boxes", proprietary systems
    - collateral effects (+DOC, +hardness, -nutrients)

Dissolved Zinc Removal by Swales

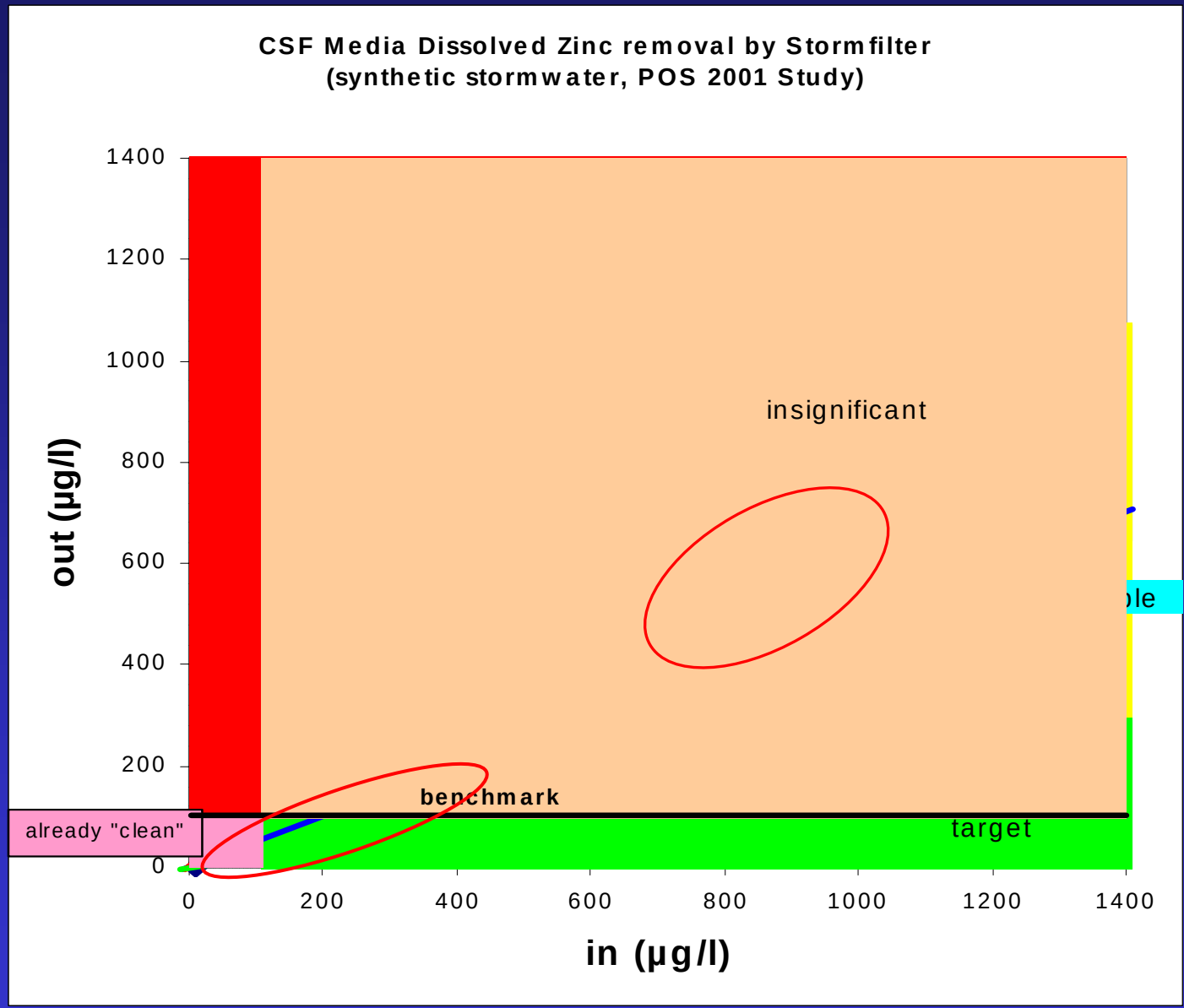
(ASCE, NPRP, 9 studies, 41 events)

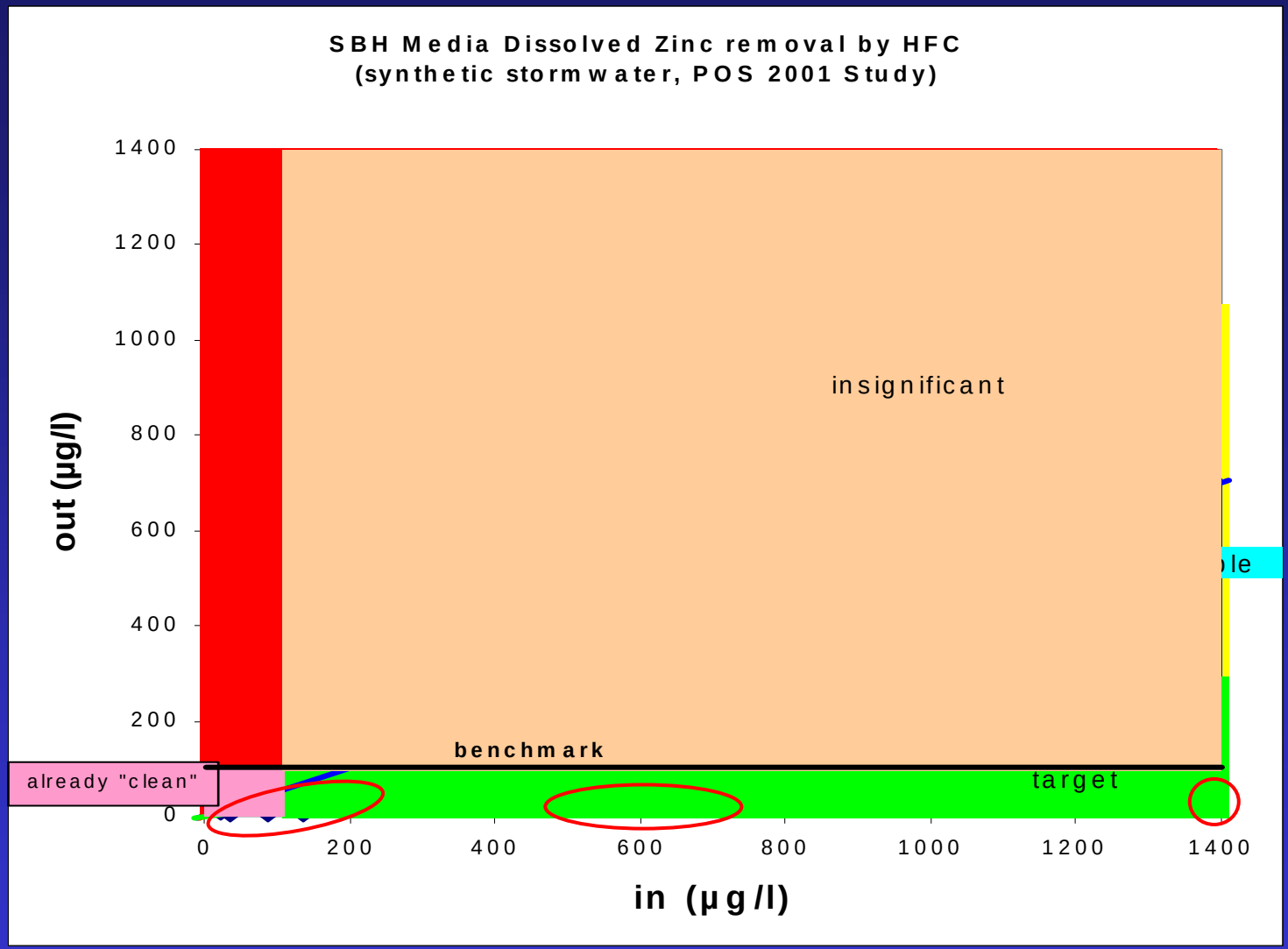


StormFilter® Cartridges

- Supplied by Stormwater Management, Inc.
- 2.4 ft^3 media held within mesh screen
- SOR ~ 1.1 gpm/sq. ft.

Scaled media tests at SeaTac Airport

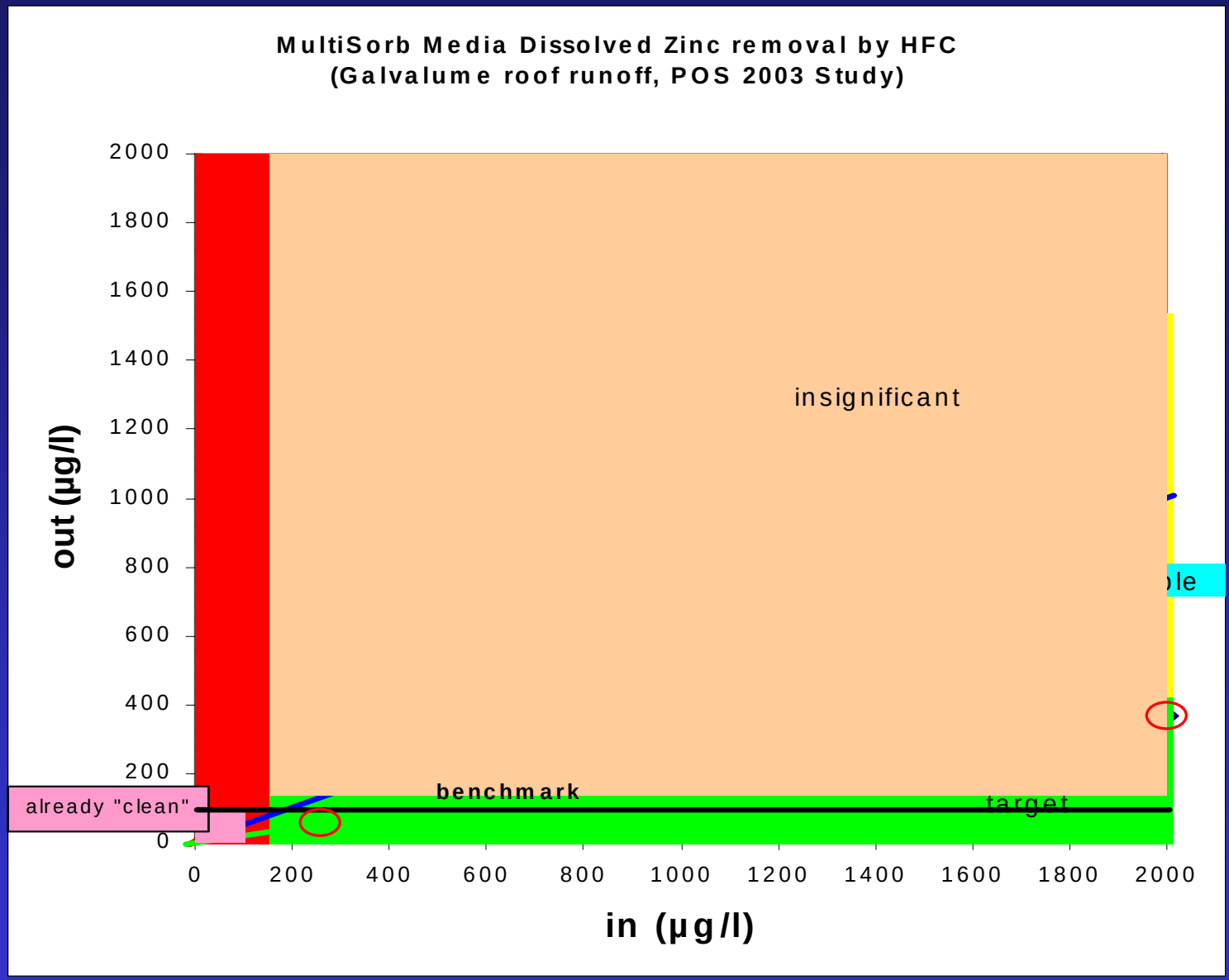

CSF Media Dissolved Zinc removal by Stormfilter
(synthetic stormwater, POS 2001 Study)
1400
1200
1000
800
600
400
200
0
out (µg/l)
insignificant
benchmark
target
already "clean"
0
200
400
600
800
1000
1200
1400
in (µg/l)


SBH Media Dissolved Zinc removal by HFC
(synthetic stormwater, POS 2001 Study)
1400
1200
1000
800
600
400
200
0
out (µg/l)
insignificant
benchmark
already "clean"
target
0
200
400
600
800
1000
1200
1400
in (µg/l)

DownSpout StormFilter®

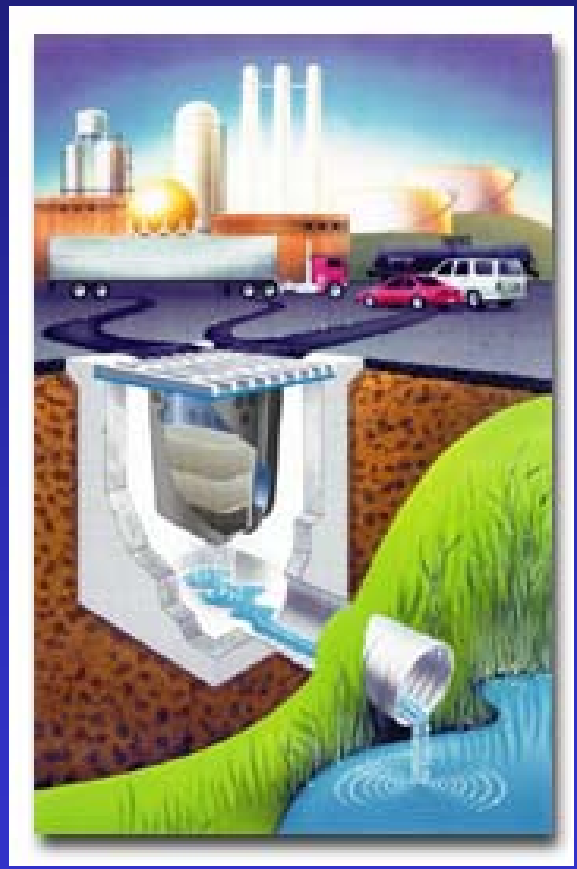
DownSpout StormFilter®
(at loading dock)

Roof Runoff Test Setup


MultiSorb Media Dissolved Zinc removal by HFC
(Galvalume roof runoff, POS 2003 Study)
out (µg/l)
2000
1800
1600
1400
1200
1000
800
600
400
200
0
insignificant
already "clean"
benchmark
target
0
200
400
600
800
1000
1200
1400
1600
1800
2000
in (µg/l)

Catch Basin Inserts

- Variety of designs
- Some tested
- Media contact/configuration
- HydroKleen^{tm}



Conclusions

- **Laboratory scale testing good screen to optimize on-site testing**
- **StormFilter® is flexible media delivery system**
- **Multiple performance measures:**
  - % removal
  - Effluent quality
  - Longevity & Collateral Effects
  - Useful life: maintenance cycles
- **Organic media has high promise**